

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
J.F. KENNEDY FEDERAL BUILDING
BOSTON, MA 02203-2211

MEMORANDUM

DATE: February 15, 1994

SUBJ: Glyphosate - Technical Criteria Waiver Request
- Ground Water and Surface Water

FROM: Marilyn K. Goldberg *M.K.G.*

TO: Robert Mendoza, Chief - Water Supply Section
Mark Sceery

This memorandum summarizes a review of information on the herbicide glyphosate. Sources for this review included articles and literature acquired by EPA and articles supplied to EPA by the states.

Objective

The objective of this review was to examine current and past glyphosate information (analytical data in drinking water, environmental fate and decomposition products) in order to provide information to EPA to support its decision on the State requests for technical criteria waivers.

Basis for Waiver Request

According to Lee Corte-Real's (Environmental Chemist with MA Dept. of Food and Agriculture) letter to Tara Gallagher, dated March 26, 1992, data from studies of the environmental fate of glyphosate indicated a low potential for glyphosate to contaminate ground water. This conclusion is based on fact that glyphosate is strongly bound to clay and organic matter fractions in soil. It is further stated that the low potential for ground water contamination is demonstrated by the fact it has never been detected in the 103 samples taken nationwide or in the samples taken from test wells in the town of Bourne, MA.

There was no justification for the surface water waiver request.

References Provided by States

Eight references were provided by the States to support the waiver request:

1. Glyphosate, Health Advisory, U.S. EPA, Office of Drinking Water (August 1988)

2. Unknown Source, Information on glyphosate, pp. G-- , G-7, G-21 - G-26 (date unknown)
3. "Guidance for the Reregistration of Pesticide Products Containing Glyphosate as the Active Ingredient", pp. 13-14, U.S. EPA, Office of Pesticides, NTIS PB87-103214 (June 1986)
4. Unknown Source, Information on glyphosate, pp. II-127,128,129 (date unknown)
5. "A Review of the Herbicide Glyphosate Pursuant to 333 CMR 11.04 (1)(d)", MA DFA and DEQE ad hoc Committee (April 13, 1989)
6. "Herbicide Handbook of the Weed Society of America", Fifth Edition, Weed Science Society of America, Glyphosate, pp. 258-263 (1983)
[State copy print not clear but acquired copy from different edition - page numbers differ - content appears to be identical]
7. Roundup, Herbicide Bulletin, Number 3, The Health and Environmental Safety Aspects of Roundup Herbicide: An Overview, pp. 1 and 4, Monsanto (July 198?)
8. Torstensson, L., Behavior of Glyphosate in Soils and Its Degradation, The Herbicide Glyphosate, Chapter 9, pp. 139-50 (1985)

Sources Used For Additional Information

1. LAN Databases
HSELINE - Health & Safety Executive (U.K.)
POLTOX - Pollution and Toxicology
IRIS - Integrated Risk Information System
HSDB - U.S. National Library of Medicine
2. Grossbard, B. & Atkinson, D., The Herbicide Glyphosate, Chapters 1 & 13, Butterworth (1985)
3. Montgomery, John H., Hydrochemicals Desk Reference Environmental Data, pp. 231-32, Lewis Publishers (1993)

Comments and Conclusions

1. Glyphosate, N-(phosphonomethyl)glycine, is a non-selective, post-emergence herbicide to control vegetation growth. Due to its limited solubility in water the salts of this acid are generally used in its application as an herbicide. The term glyphosate is often used in the literature for both the acid and its salts because they are considered biologically equivalent.
2. Glyphosate in Ground Water - The literature confirms that it is not likely glyphosate will be a contaminant in ground water. There are several reasons, as opposed to a single factor, to support this thesis.

a. Glyphosate is rapidly adsorbed by the soil and is tightly bound to soil particles. It is the phosphate ion of the glyphosate which bind to the soil, so the most rapid bonding of glyphosate to soil is in soils with a low phosphate ion concentration.

b. Glyphosate is practically immobile in soil, mainly because of its strong adsorption to soil. Glyphosate mobility is increased slightly in soils with a high pH and in soils with high levels of inorganic phosphate.

c. Glyphosate is degraded in soil. The rates of degradation or decomposition will vary according to soils, soil conditions and climate.

(1) The primary degradation of glyphosate in soil is microbial. Glyphosate is readily metabolized by soil microorganisms to produce aminomethylphosphonic acid (its main metabolite), phosphoric acid, ammonia and carbon dioxide.

(2) Glyphosate is to a very minor extent chemically degraded in soil. The degradation products cannot be identified with certainty.

3. Glyphosate in Surface Waters - The literature is sparse concerning the likelihood of glyphosate being a contaminant in surface waters or its fate in those waters but glyphosate is not viewed as a threat to the aquatic environment. There are a very limited number of studies on the fate of glyphosate in the natural aquatic environment.

a. The use of glyphosate is likely to increase because of its many desirable herbicidal properties. With increased usage there is more likelihood of glyphosate getting into surface waters during spraying applications or accidental spills. It is for this reason the literature recommends further studies on the fate of glyphosate in water.

b. There have been several studies to support statements in the literature of glyphosate's low tendency to runoff. Therefore, the primary route for glyphosate to get into surface waters would be during spraying applications. Losses to the atmosphere during spraying applications is negligible because of the low volatility of glyphosate.

c. It appears unlikely glyphosate will be found in surface waters unless it is used to control aquatic weeds. This seems to be the reason for the limited information on the fate of glyphosate in a natural water environment.

d. Studies on the fate of glyphosate in natural waters claim at least three pathways of dissipation are possible.

(1) The primary degradation pathway is microbial, yielding aminomethylphosphonic acid and carbon dioxide. It is believed degradation is slower in water than in soil because there are usually less microorganisms in water.

(2) The adsorption of glyphosate to sediments in water (soil and mineral materials) followed by slow microbial degradation.

(3) Although photolytic degradation of glyphosate in soil is reported to be minimal, it is believed to be a slightly more important degradation pathway in water. In water, glyphosate is photolytically degraded to aminomethylphosphonic acid and ammonia.

4. The present knowledge of glyphosate use, behavior and degradation indicates there is no reason to believe the herbicide glyphosate should be a contaminant in ground or surface waters.

cc: Jane Downing